ESD.864
Problem Set #1: Total 20 points
Due Thursday, February 28 at 10:31am[1]

Question 1. Making Models (5 points)
For this question, you will need to visit the Boston Museum of Science, which is located about a 15 minute walk from MIT. See http://www.mos.org/visitor_info/maps_and_directions for directions. MIT students get into the museum free, and you just need to show your MIT ID at the door. The Making Models exhibit (http://www.mos.org/exhibits_shows/current_exhibits&d=104) is located in the blue wing on Level 2. Posted on the Course Website are the museum's educational goals for the exhibit and an exhibit evaluation report.

After touring the exhibit, write a 1-page response to the following question:
Is the public's understanding of models (as illustrated through the exhibit and goals) different from what ou, as a researcher, understand them? Use examples from the exhibit and the educational goals to support our argument.

Question 2. Verification and Validation (10 points)

Conduct a verification, validation and uncertainty quantificiation (VV&UQ) of the (very) simple model posted at the following URL:
http://selin.scripts.mit.edu/esd864/pset1.html

The model is a procedure that simulates the result of a simple mathematical calculation (taking a square root). Thus, you should all be able to create "data" that this model simulates from a different source, and have a good understanding of the underlying process that this program is modeling.

Describe your VV&UQ procedure, including identification and characterization of uncertainties and validation metrics. There are several ways to approach this, and you need not follow a particular V&V method exactly, but the stages described in the readings will be a good start. The simplicity of this model means you should be able to figure it out quickly – the goal of the problem is for you to be explicit about the process you use for VV&UQ and describe it thoroughly, including all steps you take and their quantitative results. (Because you don't have a specific model "user", you can and should make some assumptions about user requirements for this sort of model, and explain what you are assuming.)

A good answer will describe what V&V means in this context (addressing verification and validation separately), address input and output uncertainties, identify your source of "experimental" data (you can use another program that you

[1] FYI: the week of Feb. 18th is elementary school vacation week in Boston and a very busy time for the museum. Plan accordingly.

assume to have undergone V&V, like Excel or Matlab, or a pocket calculator, but you might want to address uncertainties if any in that data, such as those that could be caused by rounding), conduct a quantitative analysis between modeled and experimental data, and draw appropriate conclusions based on this analysis. (Clarification: while verification usually encompasses numerical accuracy, given the purpose of the model at hand we'll consider here that the operation and accuracy of the square root function is a component of "validation." Your *verification* could focus on, for example, whether the model gives an answer for a particular range or type of input.)

Summarize the outcome of your V&V in a brief recommendation targeted to a model user.

Question 3. Interpreting V&V (5 points)

Identify and briefly describe a model you are familiar with (it can be from your own work or research, one of the examples in class, etc.) Has the model been formally verified and validated? If so, describe the procedure. If not, why not? Should it be? (please keep your answer to <1 page)

Optional: 1 point extra credit
Please attach a fun photo of a model from the museum. Creativity and curiosity are highly encouraged!

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